

Application No. 10/718,884
Response to Office Action

Customer No. 01933

Listing of Claims:

1. (Currently Amended) An illumination apparatus for a microscope, comprising:

a light source for white light;

beam splitting means for splitting a light beam emitted from the light source into a plurality of beams of irradiation light;

wavelength-selective means, including a plurality of wavelength-selective members which are provided on respective optical paths of the beams of irradiation light split by the beam splitting means, for selecting wavelengths of the beams of irradiation light;

light-amount adjusting means, including a plurality of light-amount adjusting members which are provided on the respective optical paths of the beams of irradiation light split by the beam splitting means, for adjusting intensities of the plurality of beams of irradiation light; and

beam synthesizing means for synthesizing the plurality of beams of irradiation light whose wavelengths are selected, into a single light beam.

2. (Currently Amended) An illumination apparatus for a microscope, comprising:

a light source for white light;

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beam splitting means for splitting a light beam emitted from
5 the light source into beams of first irradiation light and second
irradiation light;

a first wavelength-selective means member for selecting a
wavelength of the first irradiation light;

10 a first light-amount adjusting member for adjusting an
intensity of the first irradiation light;

a second wavelength-selective means member for selecting a
wavelength of the second irradiation light;

a second light-amount adjusting member for adjusting an
intensity of the second irradiation light; and

15 beam synthesizing means for synthesizing the beams of the
first irradiation light whose wavelength is selected and the
second irradiation light whose wavelength is selected, into a
single light beam.

3. (Currently Amended) An illumination apparatus for a
microscope, comprising:

a light source for white light;

beam splitting means for splitting a light beam emitted from
5 the light source into a plurality of beams of irradiation light;

wavelength-selective means, including a plurality of
wavelength-selective members which are provided on respective
optical paths of the beams of irradiation light split by the beam

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splitting means, for selecting wavelengths of the beams of
10 irradiation light;

light-amount adjusting means, including a plurality of
light-amount adjusting members which are provided on the
respective optical paths of the beams of irradiation light split
by the beam splitting means, for adjusting intensities of the
15 plurality of beams of irradiation light;

beam synthesizing means for synthesizing the plurality of
beams of irradiation light whose wavelengths are selected, into a
single light beam;

20 a mirror for introducing the light beam synthesized by the
beam synthesizing means in a direction in which a specimen is
irradiated and for transmitting light from the specimen;

an objective lens interposed between the mirror and the
specimen;

25 imaging elements for imaging fluorescent light from the
specimen, which passes through the objective lens and the mirror,
after the fluorescent light is separated into fluorescent light
excited by individual wavelengths; and

image processing means for processing fluorescent images
formed by the imaging elements.

4. (Currently Amended) An image processing apparatus using
an illumination apparatus, the illumination apparatus comprising:

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a light source for white light;
beam splitting means for splitting a light beam emitted from
5 the light source into a plurality of beams of irradiation light;
wavelength-selective means, including a plurality of wavelength-selective members which are provided on respective optical paths of the beams of irradiation light split by the beam splitting means, for selecting wavelengths of the beams of
10 irradiation light;
light-amount adjusting means, including a plurality of light-amount adjusting members which are provided on the respective optical paths of the beams of irradiation light split by the beam splitting means, for adjusting intensities of the
15 plurality of beams of irradiation light;
beam synthesizing means for synthesizing the plurality of beams of irradiation light whose wavelengths are selected, into a single light beam;
a mirror for introducing the light beam synthesized by the
20 beam synthesizing means in a direction in which a specimen is irradiated and for transmitting light from the specimen;
an objective lens interposed between the mirror and the specimen;
imaging elements for imaging fluorescent light from the
25 specimen, which passes through the objective lens and the mirror,

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after the fluorescent light is separated into fluorescent light excited by individual wavelengths; and

image processing means for processing fluorescent images formed by the imaging elements.

5. (Currently Amended) An illumination apparatus for a microscope, comprising:

a light source for white light;

beam splitting means for splitting a light beam emitted from 5 the light source into two beams of first irradiation light and second irradiation light;

a first wavelength-selective means member for selecting a wavelength of the first irradiation light;

10 a first light-amount adjusting member for adjusting an intensity of the first irradiation light;

a second wavelength-selective means member for selecting a wavelength of the second irradiation light;

a second light-amount adjusting member for adjusting an intensity of the second irradiation light;

15 beam synthesizing means for synthesizing the beams of the first irradiation light whose wavelength is selected and the second irradiation light whose wavelength is selected, into a single light beam;

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a mirror for introducing the light beam synthesized by the
20 beam synthesizing means in a direction in which a specimen is
irradiated and for transmitting light from the specimen;

an objective lens interposed between the mirror and the
specimen;

25 imaging elements for imaging fluorescent light from the
specimen, which passes passing through the objective lens and the
mirror, after the fluorescent light is separated into fluorescent
light excited by a first wavelength and fluorescent light excited
by a second wavelength; and

30 image processing means for processing fluorescent images
formed by the imaging element.

6. (Currently Amended) An image processing apparatus using
an illumination apparatus, the illumination apparatus comprising:

a light source for white light;

5 beam splitting means for splitting a light beam emitted from
the light source into two beams of first irradiation light and
second irradiation light;

a first wavelength-selective means member for selecting a
wavelength of the first irradiation light;

10 a first light-amount adjusting member for adjusting an
intensity of the first irradiation light;

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a second wavelength-selective means member for selecting a wavelength of the second irradiation light;

a second light-amount adjusting member for adjusting an intensity of the second irradiation light;

15 beam synthesizing means for synthesizing the beams of the first irradiation light whose wavelength is selected and the second irradiation light whose wavelength is selected, into a single light beam;

20 a mirror for introducing the light beam synthesized by the beam synthesizing means in a direction in which a specimen is irradiated and for transmitting light from the specimen;

an objective lens interposed between the mirror and the specimen;

25 imaging elements for imaging fluorescent light from the specimen, which passes through the objective lens and the mirror, after the fluorescent light is separated into fluorescent light excited by a first wavelength and fluorescent light excited by a second wavelength; and

30 image processing means for processing fluorescent images formed by the imaging element.

Claims 7-10 (Canceled).

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11. (Currently Amended) An illumination apparatus for a microscope according to claim 1 or 3 or 7, further comprising wherein at least one of the plurality of light-amount adjusting means for adjusting an intensity of at least one of the plurality of beams of irradiation light members is movable in and out of the optical path on which it is provided.

5 12. (Currently Amended) An image processing apparatus according to claim 4 or 8, wherein the illumination apparatus further comprises at least one of the plurality of light-amount adjusting means for adjusting an intensity of at least one of the plurality of beams of irradiation light members is movable in and out of the optical path on which it is provided.

5 13. (Currently Amended) An illumination apparatus for a microscope according to claim 2 or 5 or 9, further comprising wherein at least one of : (a) the first light-amount adjusting means for adjusting an intensity of the first irradiation light member and (b) the second light-amount adjusting means for adjusting an intensity of the second irradiation light member is movable in and out of a split optical path from the beam splitting means.

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14. (Currently Amended) An image processing apparatus according to claim 6 or 10, wherein the illumination apparatus further comprises at least one of: (a) the first light-amount adjusting means for adjusting an intensity of the first irradiation light member and (b) the second light-amount adjusting means for adjusting an intensity of the second irradiation light member is movable in and out of a split optical path from the beam splitting means.

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15. (Withdrawn - Currently Amended) An illumination apparatus for a microscope according to claim 3 or 7, further comprising polarization direction selective means for selecting a polarization direction of at least one of the plurality of beams of irradiation light.

16. (Withdrawn - Currently Amended) An image processing apparatus according to claim 4 or 8, wherein the illumination apparatus further comprises polarization direction selective means for selecting a polarization direction of at least one of the plurality of beams of irradiation light.

17. (Withdrawn - Currently Amended) An illumination apparatus for a microscope according to claim 5 or 9, further comprising at least one of: (a) first polarization direction

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selective means for selecting a polarization direction of the
5 first irradiation light and (b) second polarization direction
selective means for selecting a polarization direction of the
second irradiation light.

Claim 18 (Canceled).

19. (Currently Amended) An illumination apparatus for a microscope according to claim 3 or 7, further comprising wavelength distribution monitoring means for monitoring a wavelength distribution of at least one of the plurality of beams of irradiation light.

20. (Currently Amended) An image processing apparatus according to claim 4 or 8, wherein the illumination apparatus further comprises wavelength distribution monitoring means for monitoring a wavelength distribution of at least one of the plurality of beams of irradiation light.

21. (Currently Amended) An illumination apparatus for a microscope according to claim 5 or 9, further comprising wavelength distribution monitoring means for monitoring at least one of: a wavelength distribution of the first irradiation light and a wavelength distribution of the second irradiation light.

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22. (Currently Amended) An image processing apparatus according to claim 6 ~~or 10~~, wherein the illumination apparatus further comprises wavelength distribution monitoring means for monitoring at least one of: a wavelength distribution of the 5 first irradiation light and a wavelength distribution of the second irradiation light.

23. (Previously Presented) An illumination apparatus for a microscope according to claim 3 or 5, wherein the mirror comprises a semi-transmissive mirror.

24. (Previously Presented) An image processing apparatus according to claim 4 or 6, wherein the mirror comprises a semi-transmissive mirror.

25. (Withdrawn - Currently Amended) An illumination apparatus for a microscope according to ~~any one of claims~~ claim 3 [[,]] or 5, ~~7, or 9,~~ wherein the beam splitting means and the beam synthesizing means comprise dichroic mirrors.

26. (Withdrawn - Currently Amended) An image processing apparatus according to ~~any one of claims~~ claim 4 [[,]] or 6, ~~8, or 10,~~ wherein the beam splitting means and the beam synthesizing means comprise dichroic mirrors.

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27. (Withdrawn - Currently Amended) An illumination apparatus for a microscope according to ~~any one of claims~~ claim 3 ~~[1,]~~ or 5, ~~7, or 9,~~ wherein the beam splitting means and the beam synthesizing means comprise polarization beam splitters.

28. (Withdrawn - Currently Amended) An image processing apparatus according to ~~any one of claims~~ claim 4 ~~[1,]~~ or 6, ~~8,~~ ~~or~~ 10, wherein the beam splitting means and the beam synthesizing means comprise polarization beam splitters.

29. (Currently Amended) An illumination apparatus for a microscope according to claim 3 ~~or~~ 7, wherein ~~the wavelength-selective means comprises a plurality of wavelength-selective means, at least one of which the plurality of wavelength-selective members~~ is movable in and out of ~~an the~~ optical path split by ~~the beam splitting means~~ on which it is provided.
5

30. (Currently Amended) An image processing apparatus according to claim 4 ~~or~~ 8, wherein ~~the wavelength-selective means comprises a plurality of wavelength-selective means, at least one of which the plurality of wavelength-selective members~~ is movable in and out of ~~an the~~ optical path split by ~~the beam splitting means~~ on which it is provided.
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31. (Currently Amended) An illumination apparatus for a microscope according to claim 5 or 9, wherein at least one of the first wavelength-selective means member and the second wavelength-selective means member is movable in and out of an optical path split by the beam splitting means.

32. (Currently Amended) An image processing apparatus according to claim 6 or 10, wherein at least one of the first wavelength-selective means member and the second wavelength-selective means member is movable in and out of an optical path split by the beam splitting means.

33. (Currently Amended) An illumination apparatus for a microscope, comprising:

a light source for white light;
beam splitting means for splitting a light beam emitted from
5 the light source into a plurality of beams of illumination light;

wavelength-selective means, provided on at least one of a plurality of optical paths of the beams of illumination light split by the beam splitting means, for selecting wavelengths of the beams of illumination light;

10 light-amount adjusting means, including a plurality of light-amount adjusting members which are provided on respective optical paths of the beams of illumination light split by the

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beam splitting means, for adjusting intensities of the plurality of beams of illumination light;

15 beam synthesizing mean for synthesizing the plurality of beams of illumination light whose wavelengths are selected, into a single light beam;

optical elements that introduce the light beam synthesized by the beam synthesizing means to a specimen;

20 image pickup elements that separately pick up, out of light beams for observation emitted from the specimen, light beams for observation generated by irradiation with illumination light of different wavelengths that is separated by wavelength; and

25 image processing means for processing images for observation picked up by the image pickup elements.

34. (Currently Amended) An image processing apparatus using an illumination apparatus, the illumination apparatus comprising:

a light source for white light;

5 beam splitting means for splitting a light beam emitted from the light source into a plurality of beams of illumination light;

wavelength-selective means, provided on at least one of a plurality of optical paths of the beams of illumination light split by the beam splitting means, for selecting wavelengths of the illumination light;

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- 10 light-amount adjusting means, including a plurality of
light-amount adjusting members which are provided on respective
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beam splitting means, for adjusting intensities of the plurality
of beams of illumination light;
- 15 beam synthesizing mean for synthesizing the plurality of
beams of illumination light whose wavelengths are selected, into
a single light beam,
 optical elements that introduce the light beam synthesized
by the beam synthesizing means to a specimen;
- 20 image pickup elements that separately pick up, out of light
beams for observation emitted from the specimen, light beams for
observation generated by irradiation with illumination light of
different wavelengths that is separated by wavelength; and
image processing means for processing images for observation
25 picked up by the image pickup elements.